Volume 50 July–December 1984

Philosophical Magazine

First Published in 1798

Physics of Condensed Matter

A Defects and Mechanical Properties

B Electronic Optical and Magnetic Properties

Europhysics Journal

Taylor & Francis
London and Philadelphia

PHILOSOPHICAL MAGAZINE

Editor
Professor E. A. Davis — Department of Physics, University of Leicester, U.K.

Associate Editors
Dr S. R. Elliott — Department of Physical Chemistry, University of Cambridge, U.K.
Professor A. J. Forty — Department of Physics, University of Warwick, U.K.
Dr M. J. Goringe — Department of Metallurgy and Science of Materials, University of Oxford, U.K.
Dr P. M. Hazzledine — Department of Metallurgy and Science of Materials, University of Oxford, U.K.

Regional Editors
Professor C. Domb — Department of Physics, Bar-Ilan University, Israel
Dr M. Duesbury — Division of Physics, National Research Council, Canada
Dr M. Kléman — Laboratoire de Physique des Solides, Université de Paris-Sud, France
Professor K. Morigaki — Institute of Solid State Physics, University of Tokyo, Ja
Dr C. Schlenker — Laboratoire d'Études des Propriétés Électroniques des Solides, CNRS-Grenoble, France
Professor A. Seeger — Institut für Physik, Max-Planck-Institut für Metallforsch Stuttgart, F.R. Germany
Dr R. A. Street — Palo Alto Research Center, Xerox Corporation, U.S.A.

Consultant Editor
Professor Sir Nevill Mott — Cavendish Laboratory, University of Cambridge, U.K.

Book Review Editor
Dr E. Marseglia — Cavendish Laboratory, University of Cambridge, U.K.

Subscription Information

Published monthly Annual subscription 1985 £224 DM 1008 US $620 ISSN 0141

Dollar rates apply to USA, Canada and Mexico. Deutschmark rates to FR Germany. Sterling apply to the UK and all other areas.

All subscriptions are payable in advance and all rates include postage. Journals are sent by air t USA, Canada and Mexico, India and Australasia. Subscriptions are entered on an annual basi from January to December. Payment may be made by sterling cheque, dollar cheque, internat money order or National Giro, or by credit card (AMEX, VISA, Mastercard/Access).

Orders originating in the following territories should be sent direct to the local distributors

USA, Canada and Mexico	Taylor & Francis Inc, 242 Cherry Street, Philadelphia, Pennsyl 19106–1906.
Japan	Kinokuniya Company Ltd, Odakyu West-Shinjuku Building, Hatsudai 1-chrome, Shibuya-ku, Tokyo 151.
India	Universal Subscription Agency Pvt. Ltd, 117/H–1/294B Model T Pandu Nagar, Kanpur 208 025.
UK and all other territories	Taylor & Francis Ltd, Rankine Road, Basingstoke, Hampshire R RG24 0PR.

Air freight and mailing in the USA by Publication Expediting Inc., 200 Meacham Avenue, Elr New York 11003. Second class postage paid at Jamaica, New York 11431. US Postmaster: address changes to *Philosophical Magazine*, Publications Expediting Inc., 200 Meacham Av Elmont, New York 11003.

Published by Taylor & Francis Ltd, 4 John Street, London WC1N 2ET, UK. Printed by Tayl Francis (Printers) Ltd, Rankine Road, Basingstoke, Hampshire RG24 0PR, UK.

CONTENTS OF VOL. 50 Nos 1–6

NUMBER 1—JULY

PART A

PAGE

Letters Section :

Two independent mechanisms of dynamical recovery in the high-temperature deformation of silicon and germanium
By H. SIETHOFF, K. AHLBORN and W. SCHRÖTER L1

On the origin of the additional electron diffraction spots from epitaxial (111) Si single-crystal films
By Y. LEREAH and E. GRÜNBAUM 1

Effect of creep substructure on the stress exponent of Al following stress reductions
By T. J. GINTER, M. S. SOLIMAN and F. A. MOHAMED 9

Relationship between the form of zone-axis patterns for HEED and the crystal potential of transition-metal dichalcogenides
By K. K. FUNG and J. W. STEEDS 25

A simple empirical *N*-body potential for transition metals
By M. W. FINNIS and J. E. SINCLAIR 45

Solid–solid phase transitions in a low-dimensionality system
By A. BONISSENT, P. PIERANSKI and P. PIERANSKI 57

Anti-phase boundary energy in β-CuZn
By H. SAKA, M. KAWASE, A. NOHARA and T. IMURA 65

Study of constitutional and thermally created lattice defects in the β′-PdIn phase
By H. G. MÜLLER and H. HAHN 71

The annealing of vacancy defects in β-NiAl. I. Vacancy loop growth in as-grown single crystals annealed in ultra-high vacuum
By A. PARTHASARATHI and H. L. FRASER 89

The annealing of vacancy defects in β-NiAl. II. The role of surface oxidation in vacancy loop growth in slowly cooled crystals
By A. PARTHASARATHI and H. L. FRASER 101

High-resolution images of planar faults and domain structures in the σ phase of an iron-base superalloy
By H. Q. YE and K. H. KUO 117

Electron diffraction from microtwins and long-period polytypes
By C. B. CARTER 133

PART B

PAGE

Letters Section:

The orientational correlation tensor in ice I, III, IV, V and VI
By G. P. JOHARI, S. J. JONES and J. PEREZ L1

The effect of temperature-dependent energies on semiconductor thermopower formulae
By P. N. BUTCHER L5

The loss of ferromagnetism in $Gd(X)Al_2$, where X is U, Th or La
By B. R. COLES, J. Y. PING and M. H. BENNETT 1

The relationship between space-charge-limited current and density of states in amorphous silicon
By J. W. ORTON and M. J. POWELL 11

Compton profile studies of amorphous and polycrystalline arsenic
By I. THEODORIDOU and N. G. ALEXANDROPOULOS 23

Recombination and excited-state absorption at photoluminescence centres in crystalline and amorphous arsenic triselenide
By L. H. ROBINS and M. A. KASTNER 29

Generalization of a new approach to the retrieval of angle-resolved single-loss profiles
By P. SCHATTSCHNEIDER and G. SÖLKNER 53

Low-temperature thermoelastic effects in glasses
By O. B. WRIGHT and W. A. PHILLIPS 63

The electronic properties of charged dislocations in semiconductors
By H. VETH and M. LANNOO 93

On the electronic structure of molten Si
By J. P. GASPARD, PH. LAMBIN, C. MOUTTET and J. P. VIGNERON 103

Impurity conduction in silicon and effect of uniaxial compression on p-type Si
By J. A. CHROBOCZEK, F. H. POLLAK and H. F. STAUNTON 113

Book reviews 157

NUMBER 2—AUGUST

PART A

A calculation of the formation energies of intrinsic defects near grain boundaries in NiO
By D. M. DUFFY and P. W. TASKER 143

PAGE

A calculation of the interaction between impurity ions and grain boundaries in NiO
By D. M. DUFFY and P. W. TASKER 155

Stacking-fault energy of II–VI compounds
By S. TAKEUCHI, K. SUZUKI, K. MAEDA and H. IWANAGA 171

Effet de l'interférence interprécipité sur la résistivité électrique dans les alliages Al–Zn
Par G. VIGIER, J. MERLIN et C. MAI 179

Weak-beam study of dislocations moving on {100} planes at 800°C in Ni_3Al
By P. VEYSSIÈRE 189

Plastic deformation of Ni_2AlTi
By M. YAMAGUCHI, Y. UMAKOSHI and T. YAMANE 205

A lattice imaging study of nitrogen precipitation in α-iron and Fe–2·17 at.% Mn
By P. FERGUSON and K. H. JACK 221

High-pressure-induced defect formation in silicon single crystals. I. Characterization of defects and conditions of their creation
By J. JUNG and M. LEFELD-SOSNOWSKA 233

High-pressure-induced defect formation in silicon single crystals. II. Mechanism of stress-field formation at precipitates
By J. JUNG 257

Dislocation structures in copper single crystals fatigued at low amplitudes
By L. BUCHINGER, S. STANZL and C. LAIRD 275

PART B

Special Issue

Bar-Ilan Conference 1983

Editorial

Metal–insulator transitions
By N. F. MOTT 161

Diffusion near the metal–insulator transition
By G. A. THOMAS 169

Localization in disordered systems
By M. KAVEH 175

Dielectric function near a polarization catastrophe
By R. N. BHATT 189

Interaction effects in disordered conductors near the metal–insulator transition
By Y. IMRY and Y. GEFEN 203

PAGE

Observation of a scale-dependent quantum diffusion near the metal–insulator transition
By I. SCHWARTZ, S. SHAFT, A. MOALEM and Z. OVADYAHU 221

Localization, eigenstates and resonances in random systems
By M. YA. AZBEL 229

Fractional dimensionality of localization and quantum Hall current relaxation
By M. YA. AZBEL and M. H. BRODSKY 237

Anderson transition in a magnetic field. A possible phase diagram
By B. SHAPIRO 241

Enhancement of susceptibility and the electrical resistivity of organic metals with a small mean free path
By O. ENTIN-WOHLMAN, M. KAVEH, H. GUTFREUND, M. WEGER and N. F. MOTT 251

Non-ergodic behaviour of Anderson insulators with and without Coulomb interactions
By M. POLLAK 265

Low-temperature studies of random Ising models
By C. DOMB and O. ENTIN-WOHLMAN 273

Critical line for irreversibility in spin glasses
By Y. YESHURUN 285

Infinitely ramified fractal lattices and percolation
By D. BEN-AVRAHAM, S. HAVLIN and D. MOVSHOVITZ 297

Percolation theoretical treatment of two-dimensional fragmentation in solids
By R. ENGLMAN, Z. JAEGER and A. LEVI 307

Book reviews 317

NUMBER 3—SEPTEMBER

PART A

The sputtering of gold single crystals by Ar^+ ions
By S. AHMAD and M. W. THOMPSON 299

The structure of moving grain boundaries in aluminium as revealed by synchrotron X-ray topography
By J. GASTALDI and C. JOURDAN 309

The numbers of critical nuclei and embryos for coherent precipitation of a new phase of different composition
By T. KAMIJO and H. FUKUTOMI 319

Hexagonal germanium and high-resolution electron microscopy
By J. R. PARSONS and C. W. HOELKE 329

PAGE

Work-hardening of dispersion-strengthened disordered Cu_3Au–SiO_2 single crystals
By A. J. ARDELL and S. PATTANAIK 339

Work-hardening of dispersion-strengthened ordered Cu_3Au–SiO_2 single crystals
By A. J. ARDELL and S. PATTANAIK 361

Methods for the measurement of rigid-body displacements at edge-on boundaries using high-resolution electron microscopy
By G. J. WOOD, W. M. STOBBS and D. J. SMITH..... 375

Mechanical behaviour associated with the premartensitic rhombohedral-phase transition in a $Ti_{50}Ni_{47}Fe_3$ alloy
By S. MIYAZAKI and K. OTSUKA 393

As segregation to grain boundaries in Si
By C. R. M. GROVENOR, P. E. BATSON, D. A. SMITH and C. WONG ... 409

Hardening of NaCl single crystals induced by Eu obstacles
By E. OROZCO M., J. SOULLARD, C. ZALDO and F. AGULLÓ-LÓPEZ..... 425

On the interpretation of diffuse scattering in electron diffraction patterns of metal carbides M_7C_3 (M = Fe, Mn, Cr)
By J. MAHY, D. VAN DYCK and S. AMELINCKX 441

PART B

Letters Section:

The electronic structure of defects in amorphous GaAs
By E. P. O'REILLY and J. ROBERTSON L9

An assessment of the structural models for amorphous SiO using MAS NMR
By R. DUPREE, D. HOLLAND and D. S. WILLIAMS L13

Measurements of the electron density in n-type a-Si : H
By R. A. STREET and J. ZESCH L19

The structure of vitreous and liquid V_2O_5
By A. C. WRIGHT L23

On the temperature dependence of electron transport by small-polaron motion
By C. M. HURD..... L29

Majority and minority carrier lifetimes in doped a-Si junctions and the energy of the dangling-bond state
By W. E. SPEAR, H. L. STEEMERS, P. G. LE COMBER and R. A. GIBSON L33

Specific heat of magnetite near the Verwey transition. Is there more than one phase transition?
By E. GMELIN, N. LENGE and H. KRONMÜLLER L41

PAGE

Evidence for a charge-density-wave instability in the purple bronze $K_{0.9}Mo_6O_{17}$
By C. ESCRIBE-FILIPPINI, K. KONATÉ, J. MARCUS, C. SCHLENKER, R. ALMAIRAC, R. AYROLES and C. ROUCAU 321

Stabilization of the Fermi level in photochromic glasses
By R. J. ARAUJO, N. F. BORRELLI and D. A. NOLAN 331

High pressure studies of $Se_{100-x}Te_x$ glasses
By G. PARTHASARATHY, K. J. RAO and E. S. R. GOPAL 335

Charge transport in molecularly doped polymers
By H. BÄSSLER 347

A model for coordination in random close packing
By D. E. G. WILLIAMS 363

Transient photoluminescence and photo-induced optical absorption in polymeric and crystalline sulphur
By S. ODA, M. A. KASTNER and E. WASSERMAN 373

Computer simulation of a two-dimensional soap froth. II. Analysis of results
By D. WEAIRE and J. P. KERMODE 379

Spin-dependent hole diffusion in a-Si : H
By H. DERSCH and L. SCHWEITZER 397

Book reviews 405

NUMBER 4—OCTOBER

PART A

Letters Section :

Atomic configurations of disclinations by computer simulation
By M. DOYAMA and R. M. J. COTTERILL L7

Point-defect clouds at low-angle boundaries in cadmium sulphide
By O. F. VYVENKO and W. SCHRÖTER L11

Precipitation and dissolution of extended defects in chromia-doped rutile
By L. A. BURSILL, M. G. BLANCHIN and D. J. SMITH 453

The structure of extended defect terminations in rutile
By D. J. SMITH, L. A. BURSILL and M. G. BLANCHIN 473

A study of slip nucleation in Fe–3·5% Si single crystals by synchrotron radiation topography
By M. DUDLEY, J. MILTAT and D. K. BOWEN 487

Solute-enhanced self-diffusion. II. An improved calculation of enhancement factors
By S. ISHIOKA and M. KOIWA 505

PAGE

A HREM study of domain structures in the H phase coexisting with the σ phase in a nickel-based alloy
By D. X. Li, H. Q. Ye and K. H. Kuo 531

Specific heat and surface melting of sodium
By G. Fritsch, H. Diletti and E. Lüscher 545

Diffusion kinetics and correlation effects for self-diffusion via vacancy pairs and triple defects in the sphalerite structure
By D. Weiler, H. Mehrer and N. A. Stolwijk 559

Fourth-order invariants for the Landau free-energy expansions of elastic phase transitions
By J. K. Liakos and G. A. Saunders 569

PART B

Letters Section :

Scaling theory applied to strong and weak pinning in ferromagnets
By P. Gaunt L45

TEM cathodoluminescence study of recombination behaviour at dislocations in indium phosphide
By H. J. Hutchinson and S. Myhajlenko L49

Numerical investigation of non-Ohmic hopping conduction in disordered systems
By H. Böttger and D. Wegener 409

Does the flexibility of ferromagnetic domain walls affect their mobility ?
By E. Nembach and W. Riehemann 421

Effect of uniaxial stress on the acceptor ground state and on hopping conduction in p-type germanium and silicon
By R. Buczko and J. A. Chroboczek 429

Reversible photodarkening and structural changes in As_2S_3 thin films
By M. Frumar, A. P. Firth and A. E. Owen 463

The measurement of low-angle structure factors of Cu_3Au by high energy electron diffraction
By A. G. Fox 477

Transport properties of hydrogenated and chlorinated amorphous silicon. Correlation with infrared transmission spectra
By S. Al Dallal, S. Kalem, J. Bourneix, J. Chevallier and M. Toulemonde 493

A Monte Carlo simulation of precipitation phenomena in a diamond lattice
By A. Desalvo and G. Ruani 505

PAGE

Annealing and crystallization processes in tetrahedrally bonded binary amorphous semiconductors
By A. MORIMOTO, T. KATAOKA, M. KUMEDA and T. SHIMIZU 517

Book reviews 539

NUMBER 5—NOVEMBER

PART A

Obituary: W. H. Taylor

Letters Section:

The image force on the dislocation near a finite length crack tip
By C. W. LUNG and L. WANG L19

Simultaneous observation of α- and β-dislocation movement and their effect on the fracture behaviour of GaAs
By P. D. WARREN, P. PIROUZ and S. G. ROBERTS L23

Conductivity correlation in systems of non-interacting particles
By J. C. DYRE 585

Diffusion of ^{60}Co in $(Co_{0\cdot8}\ Fe_{0\cdot2})_3$ V alloys in the ordered and disordered states
By S. MANTL, S. J. ROTHMAN, L. J. NOWICKI and D. BRASKI 591

Phenomenological coefficients calculated from linear response expressions for the dissociative model of atom transport in a dilute f.c.c. alloy
By Y. OKAMURA and A. R. ALLNATT 603

Ferroelastic character and study by HREM of the mechanism of the hexagonal-monoclinic phase transition of rare earth sesquioxides
By M. BEN SALEM, R. DORBEZ, B. YANGUI and C. BOULESTEIX 621

Positron annihilation studies of electron-irradiated, cold-worked and hydrogen-charged nickel
By C. S. SUNDAR, A. BHARATHI and K. P. GOPINATHAN 635

The effect of atomic order on the thermodynamic properties of the martensitic transformation in CuZn and CuZnAl alloys
By J. VIÑALS, V. TORRA, A. PLANES and J. L. MACQUERON 653

High resolution and *in situ* investigation of defects in Bi-irradiated Si
By M. O. RUAULT, J. CHAUMONT, J. M. PENISSON and A. BOURRET 667

The crystallography of annealing twins in alumina ceramics
By Y. R. SHIUE and D. S. PHILLIPS 677

PART B

PAGE

Obituary: W. H. Taylor

Dislocation core structures in α quartz derived from a valence force potential
By M. HEGGIE and M. NYLÉN 543

Amorphous structure and corrugated space. I. Theory
By J. P. GASPARD, R. MOSSERI and J. F. SADOC 557

On the susceptibility behaviour of some two-dimensional spin canted antiferromagnets
By M. M. ABDEL-KADER 569

Frequency-resolved spectroscopy and its application to the analysis of recombination in semiconductors
By S. P. DEPINNA and D. J. DUNSTAN 579

Cathodoluminescence of hydrogen-doped MgO crystals thermochemically reduced at high temperatures
By R. GONZÁLEZ, J. LLOPIS, C. BALLESTEROS and Y. CHEN 599

Anderson transition and intermediate polaron formation in WO_{3-x}. Transport properties and optical absorption
By E. SALJE and B. GÜTTLER 607

Low-temperature a.c. conductivity of vanadium dioxide crystals
By A. MANSINGH, A. K., SINHA P. N. DHEER and M. SAYER 621

Impurity promoted intergranular fracture
By C. M. SAYERS 635

Book reviews 641

NUMBER 6—DECEMBER

PART A

Letters Section:

Spinodal decomposition in TiO_2.SnO_2 studied by 1 MV HRTEM
By S. HORIUCHI, F. IZUMI, T. KIKUCHI and K. UCHIDA L29

Internal friction in concentrated solid solutions
By P. FELTHAM L35

The matrix element for inelastic scattering by a crystal
By C. D. MEEKISON and M. J. WHELAN L39

Changes in stress intensity with dislocation emission from a crack
By I.-H. LIN and J. P. HIRTH L43

PAGE

Compton profile anisotropy in Ni_3Ga
By F. Itoh, M. Cooper, R. S. Holt, D. Laundy, D. A. Cardwell and N. Kawamiya 703

On deducing a unified growth model for the ω phase in β-III Ti from small-angle neutron scattering
By M. Fatemi 711

Dissociated dislocations in GaAs observed in high resolution electron microscopy
By M. Tanaka and B. Jouffrey 733

Structure of AuGeAs determined by convergent-beam electron diffraction I. Derivation of basic structure
By R. Vincent, D. M. Bird and J. W. Steeds 745

Structure of AuGeAs determined by convergent-beam electron diffraction II. Refinement of structural parameters
By R. Vincent, D. M. Bird and J. W. Steeds 765

Self-diffusion processes in GaSb
By D. Shaw 787

Dislocation loops in elastically anistropic materials I. Small loops in β'-brass
By A. J. Morton 797

Modified Hertz theory for spherical indentation
By E. H. Yoffe 813

Stress relaxation in dilute Al–0·02 at.% Mn alloy under electron irradiation
By L. N. Bystrov, L. I. Ivanov, M. N. Pletnev and M. E. Reznitsky 829

The measurement of impact parameters by crystallographic orientation effects in electron scattering
By A. J. Bourdillon 839

Reflection electron microscopy of epilayers grown by molecular beam epitaxy
By B. C. De Cooman, K.-H. Kuesters, C. B. Carter, Tung Hsu and G. Wicks 849

Subject index 857

Index of authors (with titles) 862

Index of book reviews 871

PART B

Letters Section:

Combined tunnelling and SEM channelling analysis of metallic bilayers Al(111) epitaxed on Nb(110)
By H. J. Tao, E. D. Gibson, J. D. Verhoeven and E. L. Wolf L55

PAGE

Conduction-band tail width and minimum metallic conductivity in a-Si_xN_{1-x} :H films studied by photoconduction and optical absorption
By R. MEAUDRE and A. MEZHOUDI L63

A.c. conductivity in binary V_2O_5–P_2O_5 glasses
By L. MURAWSKI L69

Hall coefficient of liquid Ga–Te alloys
By H.-U. TSCHIRNER, K. UHLIG and M. WOBST 645

Mechanical relaxation in an ionic glass
By C. MAÏ, S. ETIENNE, J. PEREZ and G. P. JOHARI 657

Suppression of antistructural defects in crystals by an increased polarization of bonds
By J. HORÁK, P. LOŠŤÁK and L. BENEŠ 665

Infrared absorption studies of the annealing of irradiated diamonds
By G. S. WOODS 673

The electrical conductivity and thermoelectric power of nickel ferrous ferrite. Magnetic ordering effects
By T. E. WHALL, K. K. YEUNG, Y. G. PROYKOVA and V. A. M. BRABERS 689

Anomalous pressure response of luminescence in c-As_2S_3 and a-As_2SeS_2. Consequences for defect structure in chalcogenides
By B. A. WEINSTEIN 709

Electronic transitions of high probability corresponding to X-ray absorption discontinuities. II
By S. KAWATA and K. MAEDA 731

Book reviews 735

Subject index 739

Index of authors (with titles) 744

Index of book reviews 753